CLAIMS

I claim:

1. An echo/noise canceling device for suppressing echoes and background noise during Internet telephony using a personal computer (PC) coupled to the Internet, comprising:

a receive signal path

having inputs for left and right loudspeaker signals coming from said PC and having outputs for left and right loudspeaker signals for application to a respective left and right loudspeaker, having

an echo logic circuit coupled to said loudspeaker inputs for generating a microphone attenuator control signal responsive to said loudspeaker signals, and having

left and right channel attenuators coupled to said speaker outputs responsive to a speaker attenuation control signal;

a transmit signal path

having an input circuit for a microphone input signal and an output circuit for providing an audio signal to said PC, further providing an audio-mix signal derived from said microphone input signal, having

a microphone attenuation circuit responsive to said microphone attenuator control signal, and having

a capacitive isolator circuit responsive to a microphone mute control signal; and,

a microphone mute control circuit responsive to said audio-mix signal for generating said speaker attenuation control signal and said microphone mute control signal.

2. An echo/noise canceling device for suppressing echoes and background noise during Internet telephony using a personal computer (PC) coupled to the Internet, comprising:

left and right loudspeaker inputs means for accepting left and right loudspeaker signals emanating from said PC;

left and right loudspeaker output means;

signal combining means coupled to said loudspeaker input means for providing combined left and right loudspeaker signal;

echo logic circuit means coupled to said signal combining means for generating a microphone attenuator control signal responsive to said loudspeaker signals;

left and right channel attenuator means responsive to a speaker attenuation control signal coupled to said speaker input means and providing attenuated left and right loudspeaker signals coupled to respective left and right loudspeaker output means;

microphone input signal means;

microphone output means for providing an audio signal to said PC;

means for providing an audio-mix signal derived from said microphone input signal and coupled to said microphone input means;

microphone attenuation circuit means responsive to said microphone attenuator control signal coupled to said audio-mix signal;

mute control means responsive to a microphone mute control signal coupled to said audio-mix signal and to said microphone output means;

means for generating said speaker attenuation control signal derived from said audio-mix signal; and

means for generating said microphone mute control signal derived from said speaker attenuation signal.

3. A method for connecting an echo/noise canceling device for suppressing background noise in Internet Telephony having microphone input and output terminals and speaker input and output terminals to a personal computer (PC) having microphone input and speaker output terminals, comprising:

a) connecting an audio microphone to said microphone input terminal of said device;

b) connecting a speaker to said speaker output terminal of said device;

c) interconnecting said microphone output terminal of said device to the microphone input terminal of the PC;

d) interconnecting said speaker input terminal of said device to the speaker output terminal of the PC; and,

e) connecting a source of power to said device.

4. The method of claim 3 wherein the PC has left and right channel speakers and associated output terminals replacing step b) with:

b) connecting a left channel speaker and a right channel speaker to said speaker output terminal of said device.

5. The apparatus of claim 2 wherein said channel attenuator means comprises a voltage division network formed by a plurality of resistors and the emitter to collector resistance of a bi-polar transistor wherein said emitter to collector resistance is controlled by the bi-polar base bias current provided by said speaker attenuation control signal.

6. The apparatus of claim 5 wherein said signal combining means comprises two summation resistors.

7. The apparatus of claim 6 wherein said echo logic circuit means comprises a signal filter amplifier having a high-pass filter response of approximately 1 kilohertz with a low-pass cutoff at approximately 175 hertz and gain of approximately 20dB driving an absolute valve circuit with a gain of approximately 0.5 providing a DC signal driving an integrator amplifier having an RC time charging constant of approximately 4.7 milliseconds and a discharge time constant of approximately 75 milliseconds and DC gain of approximately 20dB thus generating said microphone attenuator control signal.

8. The apparatus of claim 2 wherein said means for providing said audio-mix signal comprises a Pre-Filter coupled to said microphone input having a band pass response with center frequency of approximately 2.3 kilohertz and 3dB cutoff points at approximately 287 hertz and 19.28 kilohertz the output thereof coupled to a Microphone Amplifier having a gain of approximately 32.6 dB driving a band pass filter having a center frequency of approximately 638 hertz with 3dB cutoff points at approximately 281 hertz and 1.5 kilohertz coupled to a resistive isolator thereby providing said audio-mix signal.

9. The apparatus of claim 8 wherein said microphone attenuator means comprises a voltage divider network formed by a plurality of resistors and the emitter to collector resistance of a bi-polar transistor wherein said emitter to collector resistance is controlled by the bi-polar base bias current provided by said microphone attenuation control signal.

10. The apparatus of claim 9 wherein said mute control means responsive to said microphone mute control signal comprises a capacitor coupling said audio-mix signal to

said microphone mute control signal and further capacitor coupling to said microphone means.

11. The apparatus of claim 2 wherein said means for generating said speaker attenuation signal comprises a mute control amplifier coupled to said audio-mix signal having a gain of approximately 39 dB and a band-pass response centered about approximately 4.2 kilohertz with 3dB cutoff points at approximately 723 hertz and 12.5 kilohertz coupled a Mute Control Filter having a second order low-pass filter response of approximately 723 hertz with a 3dB cutoff point at approximately 1.25 kilohertz driving an absolute valve circuit with a gain of approximately 0.5 providing a DC signal driving an integrator amplifier having an RC time charging constant of approximately 29 milliseconds and a discharge time constant of approximately 941 milliseconds and DC gain of approximately 21dB further driving an R/C Control circuit thus generating said speaker attenuation control signal.

12. The apparatus of claim 11 wherein said means for generating said microphone mute control signal comprises a voltage comparator circuit with a trip point of approximately 1.0 volts thus generating said microphone mute control signal.

13. The apparatus of claim 6 wherein said echo logic circuit means comprises a signal filter amplifier having a high-pass filter response of ranging between 980 and 1020 hertz with a low-pass cutoff ranging between 140 and 210 hertz and gain of ranging between 16 and 24 dB driving an absolute valve circuit with a gain of 0.5 providing a DC signal driving an integrator amplifier having an RC time charging constant ranging between 3.6 and 5.6 milliseconds and a discharge time constant ranging between 50 and 90

milliseconds and DC gain ranging between 16 and 24dB thus generating said microphone attenuator control signal.

14. The apparatus of claim 2 wherein said means for providing said audio-mix signal comprises a Pre-Filter coupled to said microphone input having a band pass response with center frequency ranging between 1.8 and 2.8 kilohertz and 3dB cutoff points ranging between 230 and 344 hertz and ranging between and 15.41 and 23.15 kilohertz the output thereof coupled to a Microphone Amplifier having a gain ranging between 26.1 and 39.1 dB driving a band pass filter having a center frequency ranging between 511 and 765 hertz with 3dB cutoff points ranging between 225 and 337 hertz and ranging between 1.2 and 1.8 kilohertz coupled to a resistive isolator thereby providing said audio-mix signal.

15. The apparatus of claim 14 wherein said microphone attenuator means comprises a voltage divider network formed by a plurality of resistors and the emitter to collector resistance of a bi-polar transistor wherein said emitter to collector resistance is controlled by the bi-polar base bias current provided by said microphone attenuation control signal.

16. The apparatus of claim 15 wherein said mute control means responsive to said microphone mute control signal comprises a capacitor coupling said audio-mix signal to said microphone mute control signal and further capacitor coupling to said microphone means.

17. The apparatus of claim 2 wherein said means for generating said speaker attenuation signal comprises a mute control amplifier coupled to said audio-mix signal having a gain of ranging between 31.2 and 46.8 dB and a band-pass response centered about a range of 5.0 to 3.4 kilohertz with 3dB cutoff points ranging between 580 and 867 hertz and

ranging between 10.0 and 15.0 kilohertz coupled a Mute Control Filter having a second order low-pass filter response ranging between 580 and 867 hertz with a 3dB cutoff point ranging between 1.0 and 1.5 kilohertz driving an absolute valve circuit with a gain of 0.5 providing a DC signal driving an integrator amplifier having an RC time charging constant ranging between 23.2 and 34.8 milliseconds and a discharge time constant ranging between 753 and 1129 milliseconds and DC gain ranging between 17 and 25dB further driving an R/C Control circuit thus generating said speaker attenuation control signal.

18. The apparatus of claim 17 wherein said means for generating said microphone mute control signal comprises a voltage comparator circuit with a trip point of approximately 1.0 volts thus generating said microphone mute control signal.